

Flexible nuclear generation to foster the development of renewable energy

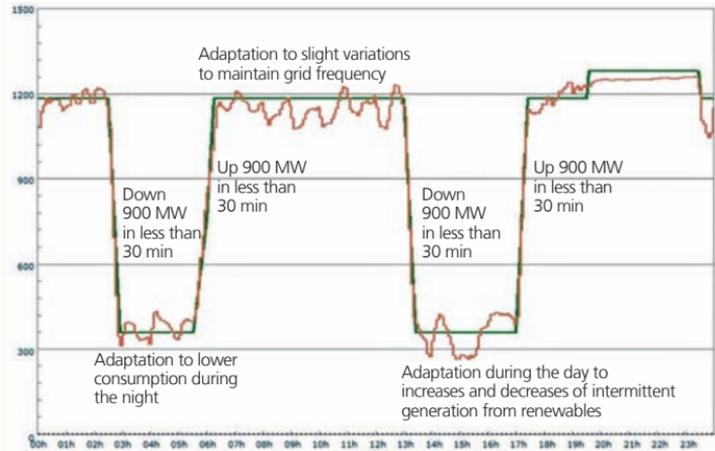
To efficiently and effectively support the expanded use of wind and solar energy, EDF has made the reactors of its nuclear fleet more modular. A 1,300 MW reactor can now increase or decrease its output by 900 MW within about 30 minutes. This is made possible by EDF's unrivalled industrial expertise and specific capabilities. EDF began to make its nuclear plants more "manoeuvrable" back in the 1980s. Due to the size of the fleet, which accounts for more than 85% of the power generated by EDF in France, nuclear output had to be made adjustable to match demand from industry, cities and regions, and households, which fluctuates greatly over a 24-hour period. This was necessary to maintain grid balance, since the amount of power generated must equal the electricity consumed at any one moment. This requirement accounts for the specific technical and industrial features of France's modular nuclear generating fleet.



In recent years, EDF has worked to further increase the operational flexibility of its reactors to make them more compatible with the intermittent renewable energy sources that have become a crucial part of every energy mix. The deployment of renewable energy is one of the keys to the transition to a low-carbon economy. New renewables – first and foremost wind and solar – are intermittent. If the wind dies down, generation stops. If a ray of sunlight bursts through the clouds, photovoltaic generation resumes. To ensure continuous supply, it is therefore necessary to either store a part of the electricity generated by renewables and use it when wind and sun are absent, or introduce capacity that can modulate its own production.

INTERESTING FACTS

THE POWER GENERATED BY ONE OF THE REACTORS (1,300 MW) AT THE GOLFECH NUCLEAR PLANT OVER A 24-HOUR PERIOD, ONE DAY IN SEPTEMBER 2015, IN RESPONSE TO VARIATIONS IN ELECTRICITY CONSUMPTION AND GENERATION FROM INTERMITTENT RENEWABLES:



In the latter case, it must be possible to rapidly reduce generation when wind and solar begin to generate their “unavoidable” energy or, conversely, rapidly start up generation when solar or wind production drops. These adjustments are especially important when intermittent generation from renewables is substantial.

Flexible nuclear generation to foster the development of renewable energy (cont.)

When the nuclear fleet is thus able to “modulate” generation (see diagram on previous page), it can serve as a low-carbon alternative to the fossil-fired capacity that is widely employed around the world. Fossil-fired plants can adapt production, but they emit large volumes of CO₂. Modular nuclear is also an alternative to the massive use of energy storage, which has not yet reached technological maturity. It can also supplement hydropower, which produces little CO₂ and is very flexible. Hydro is therefore widely used to adapt electricity generation to variations in consumption and production, but it is not sufficiently available in France (despite the country's large hydroelectric fleet) or in many other countries to be sufficient to adapt production by itself.

